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PATENT APPLICATION

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IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s):	**Richard E. Aufranc Jr. et al.**	**Confirmation No.:**	**2349**
Application No.:	**10/693,287**	**Examiner:**	**SIM, Yong H.**
Filing Date:	**October 23, 2003**	**Group Art Unit:**	**2629**

Title: Display System for an Interlaced Image Frame with a Wobbling Device

Mail Stop Appeal Brief-Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

TRANSMITTAL OF APPEAL BRIEF

Transmitted herewith is the Appeal Brief in this application with respect to the Notice of Appeal filed on July 1, 2008.

☒ The fee for filing this Appeal Brief is $510.00 (37 CFR 41.20).

☐ No Additional Fee Required.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

☐ (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d)) for the total number of months checked below:

☐ 1st Month $120 ☐ 2nd Month $460 ☐ 3rd Month $1050 ☐ 4th Month $1640

☐ The extension fee has already been filed in this application.

☒ (b) Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 08-2025 the sum of $ 510. At any time during the pendency of this application, please charge any fees required or credit any over payment to Deposit Account 08-2025 pursuant to 37 CFR 1.25. Additionally please charge any fees to Deposit Account 08-2025 under 37 CFR 1.16 through 1.21 inclusive, and any other sections in Title 37 of the Code of Federal Regulations that may regulate fees.

Respectfully submitted,

Richard E. Aufranc Jr. et al.

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Application No.: 10/693,287

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For: Display System for an Interlaced Image Frame with a Wobbling Device

Group Art Unit: 2629

Examiner: SIM, Yong H.

Confirmation No.: 2349

APPEAL BRIEF

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Sir:

This is an Appeal Brief under Rule 41.37 appealing the decision of the Primary Examiner dated 7 May 2008 (the "final Office Action" or "Action"). Each of the topics required by Rule 41.37 is presented herewith and is labeled appropriately.

I. Real Party in Interest

The real party in interest is Hewlett-Packard Development Company, LP, a limited partnership established under the laws of the State of Texas and having a principal place of business at 20555 S.H. 249 Houston, TX 77070, U.S.A. (hereinafter "HPDC"). HPDC is a Texas limited partnership and is a wholly-owned affiliate of Hewlett-Packard Company, a Delaware Corporation, headquartered in Palo Alto, CA. The general or managing partner of HPDC is HPQ Holdings, LLC.

II. Related Appeals and Interferences

There are no appeals or interferences related to the present application of which the Appellant is aware.

III. Status of Claims

Claims 1-50 are pending in the application and stand finally rejected. Accordingly, Appellant appeals from the final rejection of claims 1-50, which claims are presented in the Appendix.

IV. Status of Amendments

No amendments have been filed subsequent to the final Office Action of 7 May 2008, from which Appellant takes this appeal.

V. Summary of Claimed Subject Matter

Appellant's independent claims recite the following subject matter.

Claim 1 recites:

A display system (100) for displaying an interlaced image frame **(Appellant's specification, paragraph 0020)**, said interlaced image frame comprising a top field (120) and a bottom field (121), said top and bottom fields each having lines of pixels **(Appellant's specification, paragraph 0025)**, said system comprising:

an image processing unit (106) **(Appellant's specification, paragraph 0020)** configured to process a stream of pixel data elements sequentially corresponding to said pixels in said top (120) and bottom (121) fields and generate a number of image sub-frames (160, 161) **(Appellant's specification, paragraph 0020)**;

a modulator (103) configured to generate a light beam bearing said number of image sub-frames **(Appellant's specification, paragraphs 0020, 0022 and 0023)**; and

a wobbling device (104) configured to displace said light beam such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame **(Appellant's specification, paragraph 0020)** by an offset distance less than a pixel width **(Appellant's specification, paragraph 0038, Fig. 6B)**;

wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field (120) and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field (121) **(Appellant's specification, Fig. 9 and paragraphs 0052)**.

Independent claim 18 recites:

A method of displaying an interlaced image frame, said interlaced image frame comprising a top field (120) and a bottom field (121), said top and bottom fields each having lines of pixels **(Appellant's specification, paragraph 0020)**, said method comprising:

processing a stream of pixel data elements (127) sequentially corresponding to said pixels in said top (120) and bottom (121) fields **(Appellant's specification, Fig. 3 and paragraph 0028)** and generating a number of wobulation image sub-frames corresponding to said top (120) and bottom (121) fields **(Appellant's specification, paragraph 0030)**; and

displaying each of said image sub-frames offset from a previous image sub-frame **(Appellant's specification, paragraph 0030)** by an offset distance less than a pixel width **(Appellant's specification, paragraph 0038, Fig. 6B)**.

Independent claim 36 recites:

A system (100) for displaying an interlaced image frame, said interlaced image frame comprising a top field (120) and a bottom field (121), said top and bottom fields each having lines of pixels **(Appellant's specification, paragraph 0020)**, said system comprising:

means for processing (106) a stream of pixel data elements (127) sequentially corresponding to said pixels in said top (120) and bottom (121) fields **(Appellant's specification, Fig. 3 and paragraph 0028)** and generating a number of wobulation image sub-frames corresponding to said top (120) and bottom (121) fields **(Appellant's specification, paragraph 0030)**; and

means for displaying (103, 104 and 105) each of said image sub-frames offset from a previous image sub-frame **(Appellant's specification, paragraph 0030)** by an offset distance less than a pixel width **(Appellant's specification, paragraph 0030, Fig. 6B)**.

VI. Grounds of Rejection to be Reviewed on Appeal

The final Office Action raised the following grounds of rejection.

(1) Claims 1-4, 10-12, 17-22, 28-30, 35-38 and 44-46 were rejected as unpatentable under 35 U.S.C. § 103(a) over the combined teachings of U.S. Patent App. Pub. No. 2003/0090597 to Katoh et al. ("Katoh") and U.S. Patent No. 6,407,726 to Endo et al. ("Endo").

(2) Claims 5, 23 and 39 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Katoh, Endo and U.S. Patent No. 6,680,748 to Monti ("Monti").

(3) Claims 6-9, 13-16, 24-27, 31-34, 40-43 and 47-50 were rejected as being unpatentable under 35 U.S.C. § 103(a) over the combined teachings of Katoh, Endo and U.S. Patent No.5,581,302 to Ran et al. ("Ran").

According, Appellant hereby requests review of each of these grounds of rejection in the present appeal.

VII. Argument

(1) Claims 1-4, 10-12, 17-22, 28-30, 35-38 and 44-46 are patentable over Katoh and Endo:

In the final Office Action, the Examiner "asserts that the concept of 'wobulation' is clearly understood by [the] Examiner." (Action, p. 2). However, the final Office Action does not appear to apply the art-recognized concept of wobulation. Consequently, Appellant feels compelled to define "wobulation" as understood both in the art and defined by Appellant's specification.

> Wobulation works by overlapping pixels. It does so by generating multiple sub-frames of data while an optical image shifting mechanism (e.g. the mirror of a digital micromirror device) then displaces the projected image of each sub-frame ***by a fraction of a pixel (e.g. one-half or one-third)***. The sub-frames are then projected in rapid succession, and appear to the human eye as if they are being projected simultaneously and superimposed. For example, a high-resolution HDTV video frame is divided into two sub-frames, A and B. Sub-frame A is projected, and then the miniature mirror on a digital micromirror device switches and displaces sub-frame B one half pixel length as it is projected. When projected in rapid succession, the sub-frames superimpose, and create to the human eye a complete and seamless TV image. If the video sub-frames are aligned so that the corners of the pixels in the second sub-frame are projected at the centers of the first, the illusion of double the resolution is achieved, like in an interlaced CRT display. *Thus a lower resolution fixed pixel device using wobulation can emulate the picture of higher resolution fixed device*, at a reduced cost.

(Wikipedia.org, "wobulation") (emphasis added) (see also, Appellant's specification, paragraph 0024).

The Examiner appears to be under the mistaken impression that the Katoh system performs wobulation. (Action, p. 3). This is incorrect. Kathoh does not teach or suggest a wobulation system. Katoh does not even mention wobulation. Rather, Katoh teaches an entirely different technique that is used for blending colors, not enhancing resolution.

The Katoh technique does involve shifting or displacing sub-frames of a projected image, as occurs in wobulation. However, wobulation is more that merely shifting sub-frames. As noted above, "wobulation" requires displacing "the projected image of each sub-

frame ***by a fraction of a pixel (e.g. one-half or one-third)*** ... [so that] a lower resolution fixed pixel device using wobulation can emulate the picture of higher resolution fixed device." (Wikipedia.org, "wobulation").

In contrast, in Katoh, the shifting is always ***by an integer pixel amount*** such that two different colors are projected to a single pixel to produce a blended color result for that pixel. (Katoh, paragraph 0041). This increases the color range of the display device. According to Katoh,

> each image subframe on the projection plane is made up of pixels representing the color of the R, G or B light ray. However, the R, G and B image subframes are displayed time-sequentially at very short time intervals, which are even shorter than the time resolution of the human visual sense. Consequently, a color image is recognized by the human eyes as an afterimage.
>
> In contrast, according to the present invention, each image subframe is formed by combining the R, G and B light rays with each other as will be described in detail later. That is to say, in a subframe period, the projection plane is irradiated with the R, G and B light rays that have been modulated by the image display panel. *Each of the R, G and B light rays that have been modulated by the image display panel irradiates one position on the projection plane in one subframe period but irradiates another position on the projection plane in the next subframe period.* Then, those light rays are synthesized together with time, thereby displaying a full-color image frame thereon.

(Katoh, paragraphs 0155-6) (emphasis added).

This is ***not*** wobulation.

Part of the confusion occurs because of the term "sub-frame." In Katoh, sub-frames are separate color components of an image. When successive colored sub-frames are shifted by whole pixel amounts, different blended colors result in what is seen by a human observer. (Katoh, paragraphs 0155-6). Thus, Katoh teaches shifting the position of an R, G or B color sub-frame in successive "subframe periods" for the purpose of merging colors.

By way of contrast, in wobulation, the wobulation sub-frames are not different color components. This is because enhanced resolution is being achieved, not color blending.

In wobulation, if the display is color, the full color frame is first divided into color components. Then, the single color sub-frame is further divided into wobulation sub-frames.

A "wobbling device shifts the pixels such that each wobulation sub-frame is displayed by the display optics (105) in a slightly different spatial position than the previously displayed image sub-frame. The wobbling device (104) may shift the pixels such that the image sub-frames are offset from each other by a vertical distance and/or by a horizontal distance." (Appellant's specification, paragraph 0033). This shifting results, as indicated, in the perception by the viewer of enhanced resolution, i.e., a greater number of pixels than actually exist, with fewer pixel inaccuracies. The wobulation sub-frames mentioned are created specifically for the wobulation technique being performed and are not dependent on or necessarily related to the color components of an image frame.

Because wobulation shifts sub-frames by a fraction of a pixel width, the result is a picture that appears to have a higher resolution. Because Katoh only teaches sub-frames shifted by whole pixel amounts (Katoh, paragraphs 0155-6), the Katoh system cannot create the appearance of enhanced resolution. Consequently, Katoh does not teach or suggest anything relevant to wobulation or to how wobulation sub-frames, as opposed to color component sub-frames, are generated. Katoh has nothing to do with wobulation.

The final Office Action invites the Appellant "to provide appropriate documentation which renders that term, 'wobulation,' to specifically refer to and widely accepted as being directly related 'only' to the enhancement of said resolution." (Action, p. 3). However, the Appellant has already provided evidence both in and out of the original specification that demonstrates that the term "wobulation" as understood in the art includes the enhancement of apparent resolution. The burden would now be on the Examiner to demonstrate that the color blending of Katoh would be understood by one of skill in the art to be an example of

wobulation. This, the Examiner will not be able to do, because Katoh's technique has nothing to do with wobulation as that term is understood by those of ordinary skill in the art.

On the other hand, the Endo reference does describe a wobulation system, but does not teach or suggest the wobulation system recited by the Appellant. The Office Action assumes incorrectly that the teachings of Endo regarding wobulation are relevant to the teachings of Katoh. Once it is understood that Katoh does not teach or suggest a wobulation system, the proposed combination of teachings from Katoh and Endo is clearly unreasonable and would not have been considered by one of skill in the art who would understand that Katoh has nothing to do with wobulation.

Claim 1:

Turning to the claims themselves, claim 1 recites:

> A display system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:
> an image processing unit configured to process a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and generate a number of image sub-frames;
> a modulator configured to generate a light beam bearing said number of image sub-frames; and
> a wobbling device configured to displace said light beam such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width;
> *wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field.*

(Emphasis added).

In contrast, Katoh and Endo do not teach or suggest the claimed display system, "wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only

said pixel data elements in said bottom field." This subject matter is entirely outside the scope and content of the cited prior art.

Appellant's claim 1 recites a new relationship between the fields of an interlaced video signal and the sub-frames generated *for wobulation.* Specifically, rather than converting the interlaced video to progressive video so that it can be processed similar to any other image frame, claim 1 recites that at least one image sub-frame is formed using only data from a specific, i.e., top field, of an image frame and another at least one image sub-frame is formed using only data from a specific, i.e., bottom field, of the image frame. The cited prior art does not remotely suggest this subject matter.

On this point, the recent Office Action cites Katoh at paragraphs 0174 and 0176. (Action, p. 3). These paragraphs talk about how the Katoh color blending system could be implemented with interlaced video. In context, the cited portions of Katoh state the following:

> [0174] It should be noted that if the panel 8 is driven by an interlaced scanning technique, the scan lines on the screen are grouped into even-numbered lines and odd-numbered lines. In the interlaced scanning, either all of these even-numbered scan lines or all of these odd-numbered scan lines are alternately activated. Accordingly, T={fraction (1/30)} second.apprxeq.33.3 milliseconds. Also, the time allotted to each of the even- and odd-numbered fields that make up one frame (i.e., one field time period) is {fraction (1/60)} second.apprxeq.16.6 milliseconds. ...
>
> [0176] For example, suppose an image represented by a frame (i.e., an image frame) is as shown in (a) of FIG. 4. This image frame should be displayed in full colors, and the colors of the respective pixels are determined in accordance with the data defining this image frame. It should be noted that in the interlaced scanning technique, an image represented by a field may be processed similarly to an "image frame" as used herein.
>
> [0177] The conventional three-panel projection type image display device separates the data into three data subsets corresponding to the R, G and B light rays for the respective pixels, thereby generating three data subsets representing the R, G and B image frames as shown in (b), (c) and (d) of FIG. 4. ...
>
> [0179] ***In contrast, unlike any of these conventional techniques, the single-panel projection type image display device of this preferred embodiment sequentially***

> ***illuminates the same area on the projection plane 13 with the R, G and B light rays that have been modulated by mutually different pixel regions of the single image display panel 8, thereby forming a pixel on that same area. That is to say, taking an arbitrary pixel on the projection plane 13, the pixel is displayed by a method similar to the known field sequential technique. However, the method of this embodiment is entirely different from the conventional field sequential technique in that the R, G and B light rays that make up one pixel have been modulated by mutually different pixel regions of the single image display panel.*** FIG. 5(c) schematically shows how the R, G and B light rays that are irradiated time-sequentially are combined for a particular pixel on the projection plane 13 in one frame period. The three images shown on the left-hand side of FIG. 5(c) correspond to the three mutually different image subframes produced by the single image display panel 8.

(Emphasis added).

Thus, the cited portions of Katoh merely mention interlaced video in the context of the color blending technique of Katoh. This has absolutely nothing to do with wobulation or Appellant's claimed subject matter. Katoh does not teach or suggest the claimed "display system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising ... wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field."

The Endo reference similarly does no teach or suggest this subject matter. In contrast to Katoh, Endo actually is about wobulation. Consequently, Endo teaches the wobulation technique in which sub-frames are spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width. That's wobulation.

Because Katoh is not about wobulation, the teachings of Endo and Katoh are necessarily inconsistent and inapposite. This is clearly evident in the fact that Katoh expressly teaches, "[t]he shift amount of the subframes on the projection plane is preferably approximately an ***integral number of times as long as one pixel pitch*** as measured on the projection plane in the shifting direction." (Katoh, paragraph 0041) (emphasis added). This

is what is required for color blending. While, on the other hand, Endo is cited for teaching the opposite, i.e., a subframe displayed spatially offset from a previous image sub-frame by an offset distance less than a pixel width. That is wobulation. The Office Action does not even attempt to address this glaring inconsistency in the two cited references or the major flaw this represents in the argument to apply Katoh to the claimed subject matter.

It is unreasonable to suggest that Katoh and Endo render claim 1 obvious.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Katoh and Endo clearly did not include Appellant's claimed display system including a wobbling device that wobbulates successive subframes "such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width ... wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field." This subject matter is entirely outside the scope and content of the cited prior art.

This difference between the cited prior art and the claimed subject matter is extremely significant. The prior art does not address or provide a technique for using wobulation with interlaced video. As demonstrated herein, Katoh teaches a color blending technique and mentions interlaced video, but the ability to use wobulation for increased resolution with interlaced video is not taught, enabled or available in the cited prior art.

For at least these reasons, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*. Therefore, the rejection of Appellant's claims should not be sustained.

Claim 18:

Independent claim 18 recites:

> A method of displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said method comprising:
>
> processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and *generating a number of wobulation image sub-frames corresponding to said top and bottom fields*; and
>
> displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*

(Emphasis added).

In contrast to claim 18, as explained above, the cited prior art, including Katoh and Endo, has not taught or suggested "generating a number of *wobulation* image sub-frames *corresponding to said top and bottom fields*" of an interlaced image frame. This subject matter is entirely outside the scope and content of the cited prior art. Therefore, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*, and the rejection of Appellant's claims should not be sustained.

Claim 36:

Independent claim 36 recites:

> A system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:
>
> means for processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and *generating a number of wobulation image sub-frames corresponding to said top and bottom fields*; and

> means for displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*

(Emphasis added).

In contrast to claim 36, as explained above, the cited prior art, including Katoh and Endo, has not taught or suggested "means for displaying each of said image sub-frames offset from a previous image sub-frame *by an offset distance less than a pixel width.*" To the extent Katoh is even relevant, it teaches away from this concept. Katoh further does not teach or suggest means for "generating a number of *wobulation* image sub-frames." As demonstrated above, Katoh has nothing to do with and does not mention wobulation. Katoh and Endo further fail to teach or suggest means for "generating wobulation image sub-frames for wobulation where the image sub-frames correspond to top and bottom fields of an interlaced image frame."

This subject matter is entirely outside the scope and content of the cited prior art. Therefore, Katoh and Endo will not support a rejection of Appellant's claims under 35 U.S.C. § 103(a) and *Graham*, and the rejection of Appellant's claims should not be sustained.

<u>Claim 2:</u>

Additionally, as would be expected, the various dependent claims of the application recite additional subject matter that is not taught or suggested by Katoh. For example, claim 2 recites "wherein said image processing unit is configured to process said pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame." Appellant notes that, consistent with standard terminology in the art, the top and bottom fields of claim 2 refer to the two separate fields, each composed of every other horizontal line, in an interlaced video signal. (Appellant's specification, paragraph 0003).

In attempting to reject claim 2, the misguided Office Action cites a portion of Katoh (paragraph 0026) that describes the conventional method of generating sub-frames from a *non-interlaced* video frame. (final Office Action, p. 6). This teaching, however, is without reference or regard to the fields of an interlaced image frame. Consequently, the cited portion of Katoh clearly has nothing to do with the subject matter of claim 2.

In this regard, the final Office Action also incorrectly states that "Applicant admits that Katoh teaches interlaced video using the color blending technique." (Action, p. 3). This is the opposite of what Appellant actually argued. Rather, Appellant noted that the cited portion of Katoh "describes the conventional method of generating sub-frames from a *non-interlaced* video frame." (Response filed 26 December 2007) (emphasis added).

The final Office Action then bases the rejection of claim 2 on the incorrect position that Katoh is relevant to wobulation. (Action, p. 3). As has already been established, this is not the case.

In sum, the cited prior art has not been shown to teach or suggest "wherein said image processing unit is configured to process said pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame." This subject matter is entirely outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 2 should not be sustained.

Claim 10:

Claim 10 recites:

> wherein said image processing unit is configured to:
> process said pixel data elements in said top field to generate a first image sub-frame and a second image sub-frame; and

process said pixel data elements in said bottom field to generate a third image sub-frame and a fourth image sub-frame.

In contrast, the final Office Action notes that, according to Katoh, paragraph 0027, "the number of image subframes that make up each image frame is two." (final Office Action, p. 7). This seems to be a correct admission that Katoh does not teach or suggest the generation of third and forth image sub-frames as recited in claim 10. This is because Katoh has nothing to do with wobulation and therefore does not contemplate, teach or suggest four image sub-frames generated from the top and bottom fields of an interfaced video frame.

Thus, as apparently conceded by the final Office Action, the subject matter of claim 10 is entirely outside the scope and content of the cited prior art. Thus, no *prima facie* case of unpatentability as to claim 10 has been made. For at least these additional reasons, the rejection of claim 10 should not be sustained.

Claim 12:

Claim 12 recites:

wherein said image processing unit is further configured to:
process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame;
process every other pixel data element in said top field starting with a second pixel data element in said top field to generate said second image sub-frame;
process every other pixel data element in said bottom field starting with a first pixel data element in said bottom field to generate said third image sub-frame;
process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said fourth image sub-frame.

In contrast, as demonstrated above, none of the cited prior art reference teach or suggest generating four different image sub-frames. Moreover, the specific starting points for the processing to generating each of the four sub-frames, as recited in claim 12, is not taught or suggested in the cited prior art.

The final Office Action does not address claim 12 in any detail, merely referring to the rejection of other claims. Consequently, no *prima facie* case of unpatentability as to claim 12 has been made. Moreover, the subject matter of claim 12 is clearly outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 12 should not be sustained.

<u>(2) Claims 5, 23 and 39 are patentable over Katoh, Endo and Monti:</u>

This rejection should not be sustained for at least the same reasons given above in favor of the corresponding independent claims.

<u>Claim 5:</u>

Additionally, claim 5 recites:

> wherein said image processing unit is further configured to:
> process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame; and
> process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said second image sub-frame.

With regard to claim 5, the final Office Action concedes that Katoh and Endo do not teach or suggest the claimed subject matter. (final Office Action, p. 13). Consequently, the final Office Action cites Monti as teaching "a spatial resolution reduction process wherein the pixel values in <u>every other block</u> are read out so as to perform a spatial resolution reduction by a factor of 2." (*Id.*) (emphasis in original).

However, as would be appreciated by one of skill in the art, Monti has nothing to do with interlaced video which is divided into top and bottom fields. In the portion of Monti cited by the Action, a "block" is equivalent to a single pixel. "Each of the blocks 352 and 354

in the data structure 350 represent one pixel value produced from the pixel element in DPS sensor array 302. The pixel value may be in 8-bit or more precision. As an example, for a scene image, the controller 316 or other circuitry can control the readout of the image data from the data memory 310 such that only the pixel values in every other block are read out so as to perform a spatial resolution reduction 356 by a factor of 2. As a result, an image 358 readout from the data memory 310 is suitable as a scene image." (Monti, col. 11, lines 25-37). Appellant further notes that Monti here has nothing to do with producing image sub-frames.

Consequently, Monti's teachings regarding the "pixel values in every other block" have nothing to do with the claimed method of processing every other pixel data element in a top field and a bottom field, respectively, to produce first and second image sub-frames. Thus, no *prima facie* case of unpatentability has been made as to claim 5. Rather, the claimed subject matter is entirely outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 5 and similar claims 23 and 39 should not be sustained.

<u>(3) Claims 6-9, 13-16, 24-27, 31-34, 40-43 and 47-50 are patentable over Katoh, Endo and Ran:</u>

This rejection should not be sustained for at least the same reasons given above in favor of the corresponding independent claims.

<u>Claims 6 and 13:</u>

Additionally, claim 6 recites:

> wherein said image processing unit is further configured to:

average every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field to generate said first image sub-frame; and

average every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said second image sub-frame.

With regard to claim 6, the final Office Action concedes that Katoh and Endo do not teach or suggest the claimed subject matter. (final Office Action, p. 14). Consequently, the final Office Action cites Ran as teaching the claimed subject matter of claim 6. According to the Action, "Ran et al. disclose a technique, two facing pels along a horizontal row are averaged together to perform a linear unsampling operation." (*Id.*).

In response, Appellant notes that claim 6 has nothing to do with a linear unsampling operation. Rather, the method of claim 6 results in first and second image sub-frames. Moreover, Ran, as cited in the action, does not teach or suggest the claimed averaging of ever two neighboring pixel data elements in each line of respective top and bottom fields to produce first and second image sub-frames as recited in claim 6.

In short, no *prima facie* case of unpatentability has been made as to claim 6. Rather, the subject matter of claim 6 is entirely outside the scope and content of the cited prior art. For at least these additional reasons, the rejection of claim 6 and similar claim 13 should not be sustained.

<u>Claim 8:</u>

Claim 8 recites:

wherein said image processing unit is further configured to:

generate said first image sub-frame by computing a function of one or more pixel data elements in said top field; and

generate said second image sub-frame by computing a function of one or more pixel data elements in said bottom field.

In contrast, the final Office Action fails to individually address claim 8 or indicate where each and every element of claim 8 is taught or suggested by the cited prior art. (Action, p. 15). Consequently, no *prima facie* case of unpatentability has been made as to claim 8.

Rather, the subject matter of claim 8 is entirely outside the scope and content of the cited prior art. Specifically, none of the cited prior art references teach or suggest generating first and second image sub-frames by computing a function of one or more pixel data elements in respective top and bottom fields of interlaced video. No such teaching or suggestion has been demonstrated in the prior art. For at least these additional reasons, the rejection of claim 8 and any similar claims should not be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of 7 May 2008 is respectfully requested.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

1. (previously presented) A display system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:

an image processing unit configured to process a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and generate a number of image sub-frames;

a modulator configured to generate a light beam bearing said number of image sub-frames; and

a wobbling device configured to displace said light beam such that each of said image sub-frames is spatially displayed offset from a previous image sub-frame by an offset distance less than a pixel width;

wherein at least one of said image sub-frames is generated using only said pixel data elements in said top field and at least one of said image sub-frames is generated using only said pixel data elements in said bottom field.

2. (original) The system of claim 1, wherein said image processing unit is configured to process said pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame.

3. (original) The system of claim 2, wherein:

said first image sub-frame is displayed in a first image sub-frame location; and

said second image sub-frame is displayed in a second image sub-frame location;

wherein said second image sub-frame location is spatially offset by an offset distance from said first image sub-frame location.

4. (original) The system of claim 3, wherein said offset distance comprises a vertical offset distance and a horizontal offset distance, said second image sub-frame location being vertically offset from said first image sub-frame location by said vertical offset distance and horizontally offset from said first image sub-frame location by said horizontal offset distance.

5. (original) The system of claim 2, wherein said image processing unit is further configured to:

process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame; and

process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said second image sub-frame.

6. (original) The system of claim 2, wherein said image processing unit is further configured to:

average every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field to generate said first image sub-frame; and

average every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said second image sub-frame.

7. (original) The system of claim 6, wherein said image processing unit is configured to process a last pixel data element in each line of said bottom field in said generation of said second image sub-frame.

8. (original) The system of claim 2, wherein said image processing unit is further configured to:

generate said first image sub-frame by computing a function of one or more pixel data elements in said top field; and

generate said second image sub-frame by computing a function of one or more pixel data elements in said bottom field.

9. (original) The system of claim 8, wherein said function is a linear function.

10. (original) The system of claim 1, wherein said image processing unit is configured to:

process said pixel data elements in said top field to generate a first image sub-frame and a second image sub-frame; and

process said pixel data elements in said bottom field to generate a third image sub-frame and a fourth image sub-frame.

11. (original) The system of claim 10, wherein:

said first image sub-frame is displayed in a first image sub-frame location;

said second image sub-frame is displayed in a second image sub-frame location;

said third image sub-frame is displayed in a third image sub-frame location; and

said fourth image sub-frame is displayed in a fourth image sub-frame location.

12. (original) The system of claim 10, wherein said image processing unit is further configured to:

process every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame;

process every other pixel data element in said top field starting with a second pixel data element in said top field to generate said second image sub-frame;

process every other pixel data element in said bottom field starting with a first pixel data element in said bottom field to generate said third image sub-frame;

process every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said fourth image sub-frame.

13. (original) The system of claim 10, wherein said image processing unit is further configured to:

average every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field to generate said first image sub-frame;

average every two neighboring pixel data elements in each line of said top field starting with second and third pixel data elements in each line of said top field to generate said second image sub-frame;

average every two neighboring pixel data elements in each line of said bottom field starting with first and second pixel data elements in each line of said bottom field to generate said third image sub-frame; and

average every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said fourth image sub-frame.

14. (original) The system of claim 13, wherein said image processing unit is further configured to process a last pixel data element in each line of said top field in said generation of said second image sub-frame and a last pixel data element in each line of said bottom field in said generation of said fourth image sub-frame.

15. (original) The system of claim 10, wherein said image processing unit is further configured to:

generate said first image sub-frame by computing a function of one or more pixel data elements in said top field;

generate said second image sub-frame by computing a function of one or more pixel data elements in said top field;

generate said third image sub-frame by computing a function of one or more pixel data elements in said bottom field; and

generate said fourth image sub-frame by computing a function of one or more pixel data elements in said bottom field.

16. (original) The system of claim 15, wherein said function is a linear function.

17. (original) The system of claim 1, further comprising display optics configured to display said light beam on a viewing surface.

18. (previously presented) A method of displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said method comprising:

processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and generating a number of wobulation image sub-frames corresponding to said top and bottom fields; and

displaying each of said image sub-frames offset from a previous image sub-frame by an offset distance less than a pixel width.

19. (original) The method of claim 18, wherein said step of processing said stream of pixel data elements comprises processing said pixel data elements in said top field to generate at least one of said image sub-frames and processing said pixel data elements in said bottom field to generate at least one of said image sub-frames.

20. (original) The method of claim 19, wherein said step of processing said stream of pixel data elements further comprises processing pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame.

21. (original) The method of claim 20, wherein said step of displaying said image sub-frame comprises:

displaying said first image sub-frame in a first image sub-frame location; and

displaying said second image sub-frame in a second image sub-frame location;

wherein said second image sub-frame location is spatially offset by an offset distance from said first image sub-frame location.

22. (original) The method of claim 21, wherein said offset distance comprises a vertical offset distance and a horizontal offset distance, said second image sub-frame location being vertically offset from said first image sub-frame location by said vertical offset distance and horizontally offset from said first image sub-frame location by said horizontal offset distance.

23. (original) The method of claim 20, wherein said step of processing said stream of pixel data elements further comprises:

processing every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame; and

processing every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said second image sub-frame.

24. (original) The method of claim 20, wherein said step of processing said stream of pixel data elements further comprises:

averaging every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements each line of in said top field to generate said first image sub-frame; and

averaging every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said second image sub-frame.

25. (original) The method of claim 24, wherein said step of processing said stream of pixel data elements further comprises processing a last pixel data element in each line of said bottom field in said generation of said second image sub-frame.

26. (original) The method of claim 20, wherein said step of processing said stream of pixel data elements further comprises:

computing a function of one or more pixel data elements in said top field to generate said first image sub-frame; and

computing a function of one or more pixel data elements in said bottom field to generate said second image sub-frame.

27. (original) The method of claim 26, wherein said function is a linear function.

28. (original) The method of claim 19, wherein said step of processing said stream of pixel data elements further comprises:

processing said pixel data elements in said top field to generate said first and second image sub-frames; and

processing said pixel data elements in said bottom field to generate said third and fourth image sub-frames.

29. (original) The method of claim 28, wherein said step of displaying said image sub-frame comprises:

displaying said first image sub-frame in a first image sub-frame location;

displaying said second image sub-frame in a second image sub-frame location;

displaying said third image sub-frame in a third image sub-frame location; and

displaying said fourth image sub-frame in a fourth image sub-frame location.

30. (original) The method of claim 28, wherein said step of processing said stream of pixel data elements further comprises:

processing every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame;

processing every other pixel data element in said top field starting with a second pixel data element in said top field to generate said second image sub-frame;

processing every other pixel data element in said bottom field starting with a first pixel data element in said bottom field to generate said third image sub-frame;

processing every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said fourth image sub-frame.

31. (original) The method of claim 28, wherein said step of processing said stream of pixel data elements further comprises:

averaging every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field resulting in a first group of averaged pixel data to generate said first image sub-frame;

averaging every two neighboring pixel data elements in each line of said top field starting with second and third pixel data elements in each line of said top field to generate said second image sub-frame;

averaging every two neighboring pixel data elements in each line of said bottom field starting with first and second pixel data elements in each line of said bottom field to generate said third image sub-frame; and

averaging every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said fourth image sub-frame.

32. (original) The method of claim 31, wherein said step of processing said stream of pixel data elements further comprises:

processing a last pixel data element in each line of said top field in said generation of said second image sub-frame; and

processing a last pixel data element in each line of said bottom field in said bottom field in said generation of said fourth image sub-frame.

33. (original) The method of claim 28, wherein said step of processing said stream of pixel data elements further comprises:

computing a function of one or more pixel data elements in said top field to generate said first image sub-frame;

computing a function of one or more pixel data elements in said top field to generate said second image sub-frame.

computing a function of one or more pixel data elements in said bottom field to generate said third image sub-frame; and

computing a function of one or more pixel data elements in said bottom field to generate said fourth image sub-frame.

34. (original) The method of claim 33, wherein said function is a linear function.

35. (original) The method of claim 18, further comprising:

generating a light beam bearing said image sub-frames; and

displacing said light beam to display said image sub-frames.

36. (previously presented) A system for displaying an interlaced image frame, said interlaced image frame comprising a top field and a bottom field, said top and bottom fields each having lines of pixels, said system comprising:

means for processing a stream of pixel data elements sequentially corresponding to said pixels in said top and bottom fields and generating a number of wobulation image sub-frames corresponding to said top and bottom fields; and

means for displaying each of said image sub-frames offset from a previous image sub-frame by an offset distance less than a pixel width.

37. (original) The system of claim 36, wherein said means for processing comprises means for processing said pixel data elements in said top field to generate at least one of said image sub-frames and processing said pixel data elements in said bottom field to generate at least one of said image sub-frames.

38. (original) The system of claim 37, wherein means for processing said stream of pixel data elements further comprises processing pixel data elements in said top field to generate a first image sub-frame and said pixel data elements in said bottom field to generate a second image sub-frame.

39. (original) The system of claim 38, wherein said means for processing further comprises:

means for processing every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame; and

means for processing every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said second image sub-frame.

40. (original) The system of claim 38, wherein said means for processing further comprises:

means for averaging every two neighboring pixel data elements in each line of said top field starting with first and second pixel data elements in each line of said top field to generate said first image sub-frame; and

means for averaging every two neighboring pixel data elements in each line of said bottom field starting with second and third pixel data elements in each line of said bottom field to generate said second image sub-frame.

41. (original) The system of claim 40, wherein said means for processing further comprises means for processing a last pixel data element in each line of said bottom field in said generation of said second image sub-frame.

42. (original) The system of claim 38, wherein said means for processing further comprises:

means for computing a function of one or more pixel data elements in said top field to generate said first image sub-frame; and

means for computing a function of one or more pixel data elements in said bottom field to generate said second image sub-frame.

43. (original) The system of claim 42, wherein said function is a linear function.

44. (original) The system of claim 37, wherein number of image sub-frames comprises a first image sub-frame, a second image sub-frame, a third image sub-frame, and a fourth image sub-frame, wherein said processing means further comprises:

means for processing said top field to generate said first and second image sub-frames; and

means for processing said bottom field to generate said third and fourth image sub-frames.

45. (original) The system of claim 44, wherein said means for displaying said image sub-frames comprises:

means for displaying said first image sub-frame in a first image sub-frame location;

means for displaying said second image sub-frame in a second image sub-frame location;

means for displaying said third image sub-frame in a third image sub-frame location; and

means for displaying said fourth image sub-frame in a fourth image sub-frame location.

46. (original) The system of claim 44, wherein said processing means further comprises:

means for processing every other pixel data element in said top field starting with a first pixel data element in said top field to generate said first image sub-frame;

means for processing every other pixel data element in said top field starting with a second pixel data element in said top field to generate said second image sub-frame;

means for processing every other pixel data element in said bottom field starting with a first pixel data element in said bottom field to generate said third image sub-frame;

means for processing every other pixel data element in said bottom field starting with a second pixel data element in said bottom field to generate said fourth image sub-frame.

47. (original) The system of claim 44, wherein said processing means further comprises:

means for averaging every two neighboring pixel data elements in said top field starting with first and second pixel data elements in said top field to generate said first image sub-frame;

means for averaging every two neighboring pixel data elements in said top field starting with second and third pixel data elements in said top field to generate said second image sub-frame;

means for averaging every two neighboring pixel data elements in said bottom field starting with first and second pixel data elements in said bottom field to generate said third image sub-frame; and

means for averaging every two neighboring pixel data elements in said bottom field starting with second and third pixel data elements in said bottom field to generate said fourth image sub-frame.

48. (original) The system of claim 47, wherein said processing means further comprises:

means for processing a last pixel data element in said top field in said generation of said second image sub-frame; and

means for processing a last pixel data element in said bottom field in said bottom field in said generation of said fourth image sub-frame.

49. (original) The system of claim 44, wherein said processing means further comprises:

means for computing a function of one or more pixel data elements in said top field to generate said first image sub-frame;

means for computing a function of one or more pixel data elements in said top field to generate said second image sub-frame.

means for computing a function of one or more pixel data elements in said bottom field to generate said third image sub-frame; and

means for computing a function of one or more pixel data elements in said bottom field to generate said fourth image sub-frame.

50. (original) The system of claim 49, wherein said function is a linear function.

IX. Evidence Appendix

None

X. Related Proceedings Appendix

None